

Pend Oreille River Temperature TMDL

Introduction

- History of the TMDL
- Basic Introduction to Daily Comparison and Cumulative Frequency Analysis (CFA)
- Exceedences Using the Different Methods
- Specific Issues
 - Daily Maximum Criteria
 - State Line Heat Loading
 - Tribal WQS and Sovereignty
 - Reasons Ecology chose CFA
 - Data Pooling Period
 - Use of CFA with Interdependent Data

TMDL History

- **2004 - 2007** EPA, Kalispel Tribe, States of Washington and Idaho collaborate on TMDL
- **May 2004** –MOA between States, Tribe and EPA signed
- **2005** - EPA awards \$105,000 in grants and contracts to the Tribe for work relating to TMDL
- **July 2007** Draft Interjurisdictional TMDL shared with stakeholders
- **July 2007 – December 2009**
 - States address stakeholder comments on TMDL
 - EPA - Ecology discourse on WQS interpretation
 - Washington moves forward with TMDL using CFA
- **January 2009 - August 2010** - Two staff meetings between EPA & Kalispel Tribe
- **Fall 2010** – Draft Washington TMDL out for public comment
- **January 2011** Third staff meeting between EPA and Kalispel Tribe

TMDL History

- **Spring 2011** EPA letter to Kalispel Tribe offering consultation; Tribe accepts
- **April 2011** Ecology submits TMDL to EPA; Dam operators request dispute resolution & file lawsuits
- **Summer 2011** Consultation between RA & Tribal Chairman at reservation, followed by RA letter
- **August 2011** Dispute Resolution Process completed;
- **November 2011** Ecology submits final TMDL; Fourth Meeting between EPA & Tribal staff
- **February 2012** Phone conversation and follow up letter from Office of Water Director, Mike Bussell to Deane Osterman at Kalispel Tribe Natural Resources Department
- **Spring Summer 2012** – 2 FOIAs and FOIA appeal by Tribe
- **July 2012** – HQ meeting with Tribe

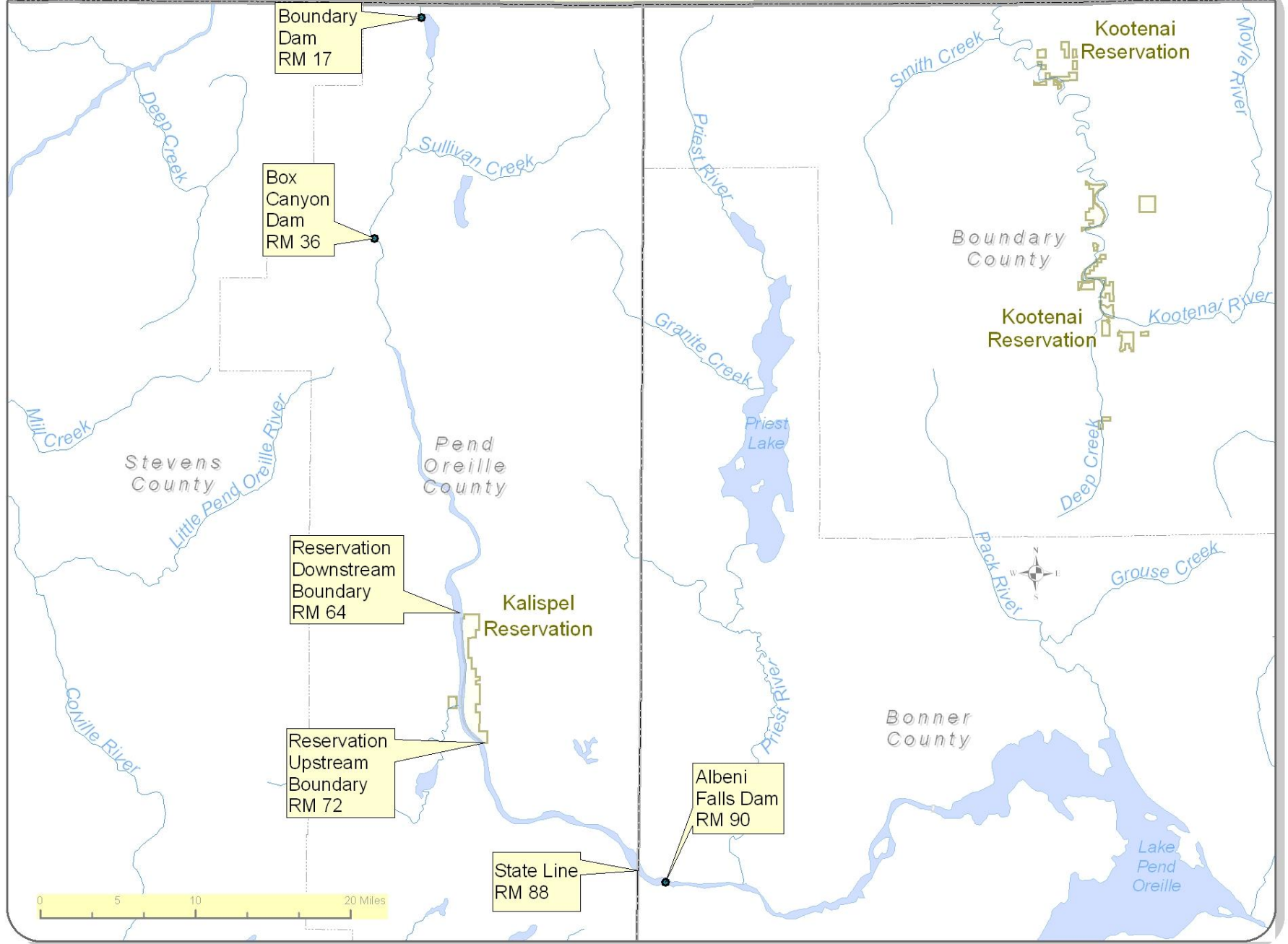
2004 Pend Oreille River TMDL MOA

- The Tribe contends the MOA fell apart under pressure from the regulated community and that EPA and Ecology catered to the dam operators and ignored the Tribe's interests
- Ecology rejected vertical (volume) averaging of temperatures in the impoundment and interpreted standards against the views of the dam operators
- The dam operators were not pleased with the TMDL – initiating dispute resolution and lawsuits upon its issuance
- EPA Supported Tribe's interests with regard to TMDL:
 - Provided the Tribe with \$105,000 in grant and contract funding for work related to the TMDL
 - Negotiated for over a year with Ecology to reverse a Pend Oreille River standards interpretation that was opposed by the Tribe
 - Successfully intervened on proposed changes to TMDL from dispute resolution process in response to Tribe's comments
 - There have been two major issues between the tribe and Ecology in this TMDL. EPA has sided with the tribe on one major issue (WQS interpretation) and with Ecology on the other (model output analysis).

Partial Attainment of 2004 MOA

- Though the entities signing the MOA felt collaboration was desirable, the MOA was not a binding agreement, and all parties understood this
- The collaboration that occurred under the MOA was invaluable to all parties – building models that are based on consistent assumptions and data, forming a strong technical basis for the TMDL
- The MOA was only partially completed (no interjurisdictional TMDL) due to loss of funding in Idaho and this dispute between Ecology and the Tribe

British Columbia



What Does the Tribe Want?

- Tribe has represented that they are satisfied with measures at Boundary and Box Canyon Dams
- Because of location – Boundary Dam does not have temperature effects on reservation waters
- Box Canyon Dam– Tribe is satisfied with measures
- Primary Issue: Albeni Falls Dam and determination of heat loading at state line
- Interest in using the TMDL to leverage discussions with the Corps re: Albeni Falls Dam

Kalispel Tribe Support from Dam Operators

- Seattle City Light (Boundary Dam)
- 4/09 - Under the FERC license Pend Oreille PUD (Box Canyon Dam) will spend \$250 million for restoration and mitigation including
 - Spend more than \$50 million on a fish passage facility. It must remove nonnative fish and reintroduce desirable trout species.
 - Restore trout habitat on 164 miles of rivers and streams that flow into the Pend Oreille River over the next 25 years.
 - Develop a plan to improve recreation facilities on the reservoir, and provide money for the tribe to build recreation facilities at the Pow Wow Grounds, Kalispel Boat Launch and Manresa Grotto Beach.
- 7/ 2012 - \$39.5 million - 10 year agreement with BPA, USBR & USACE focused on actions to address impacts of Albeni Falls Dam on fish and wildlife

Tribe's Objections to CFA

- Cannot be used to determine compliance with daily maximum criteria that are part of the State and Tribal WQS
- Masks the quantity and magnitude of temperature exceedences, in particular at the Idaho border and in Tribal waters
- It is being used in a technically inappropriate way
 - Only appropriate to use where data are random and not interdependent
 - Excessive pooling periods should not be used for short term time lag effects
- Is unacceptable for meeting the Kalispel standards in Tribe's waters
 - Violates Tribe's sovereignty
 - Does not meet downstream waters standards
- Is applied for non scientific reasons - benefit polluters

Daily Comparison Method

- The model divides the river into segments along its length
- Data generated for each segment on half hour intervals for 2004 and 2005
- There are two (relevant) model runs
 - a Natural Conditions simulation without the dams
 - an Existing Conditions simulation
- Each simulation has data for every segment and every half hour over the two years modeled
- Daily Comparison Method compares the maximum daily temperature from the Existing Conditions simulation to data from the same time and location in the Natural Conditions simulation – the difference is the magnitude of impairment

Advantages of Daily Comparison

- Simple to explain and understand
- Extensively used with one dimensional modeling and data analysis for TMDLs
- Conservative – high MOS

Drawbacks to Daily Comparison

- Not capable of eliminating or reducing time lag effects that occur in rivers with dams
- No TMDLs in R10 have used Daily Comparison with 2 dimensional models
- This type of analysis does not eliminate time lag effects that arise from the changes in stream velocity between dams in place and no dam model simulations
- This is a very conservative analysis method that does not take into account the uncertainty inherent in complex models
- This focus on “violations” rather than exceedance of loading capacity does not address the requirements of a TMDL, namely setting allocations with a linkage to human activities

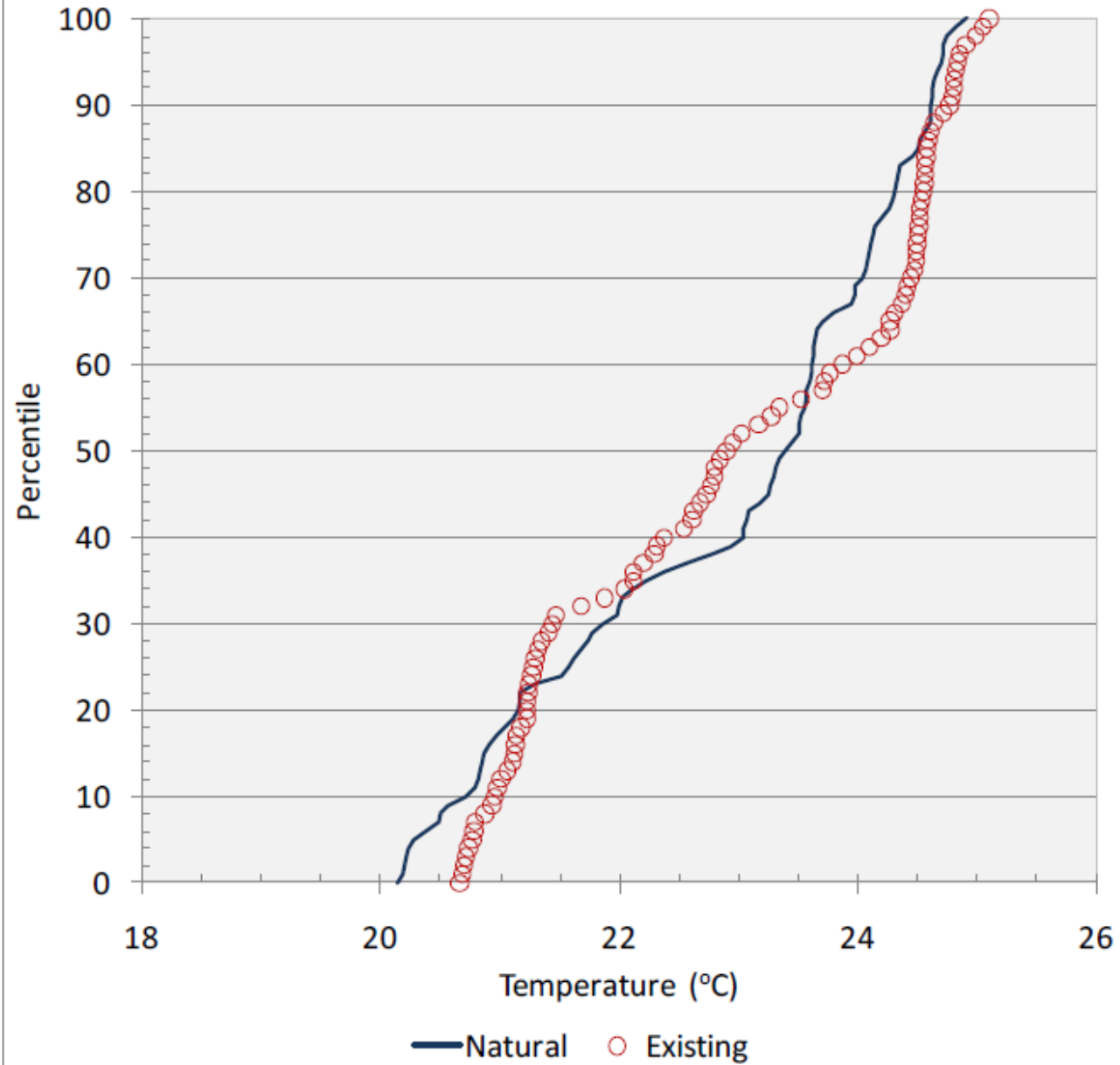
Cumulative Frequency Analysis

- CFA is a statistical analysis of two data sets
- Data distributions are compared at each rank percentile value (frequency of occurrence in the data pool)
- One cannot do a cumulative frequency analysis without first aggregating (pooling) the data

CFA in TMDL

- The daily maximum data points in the existing conditions simulation that exceed each criteria were pooled (about 62 days)
- The corresponding data points (same location, same time) in the natural conditions simulation were also pooled
- These pools of data were then plotted by cumulative frequency of occurrence in the data set

Lower Skookum Reach - 2004
1-Day Maximum

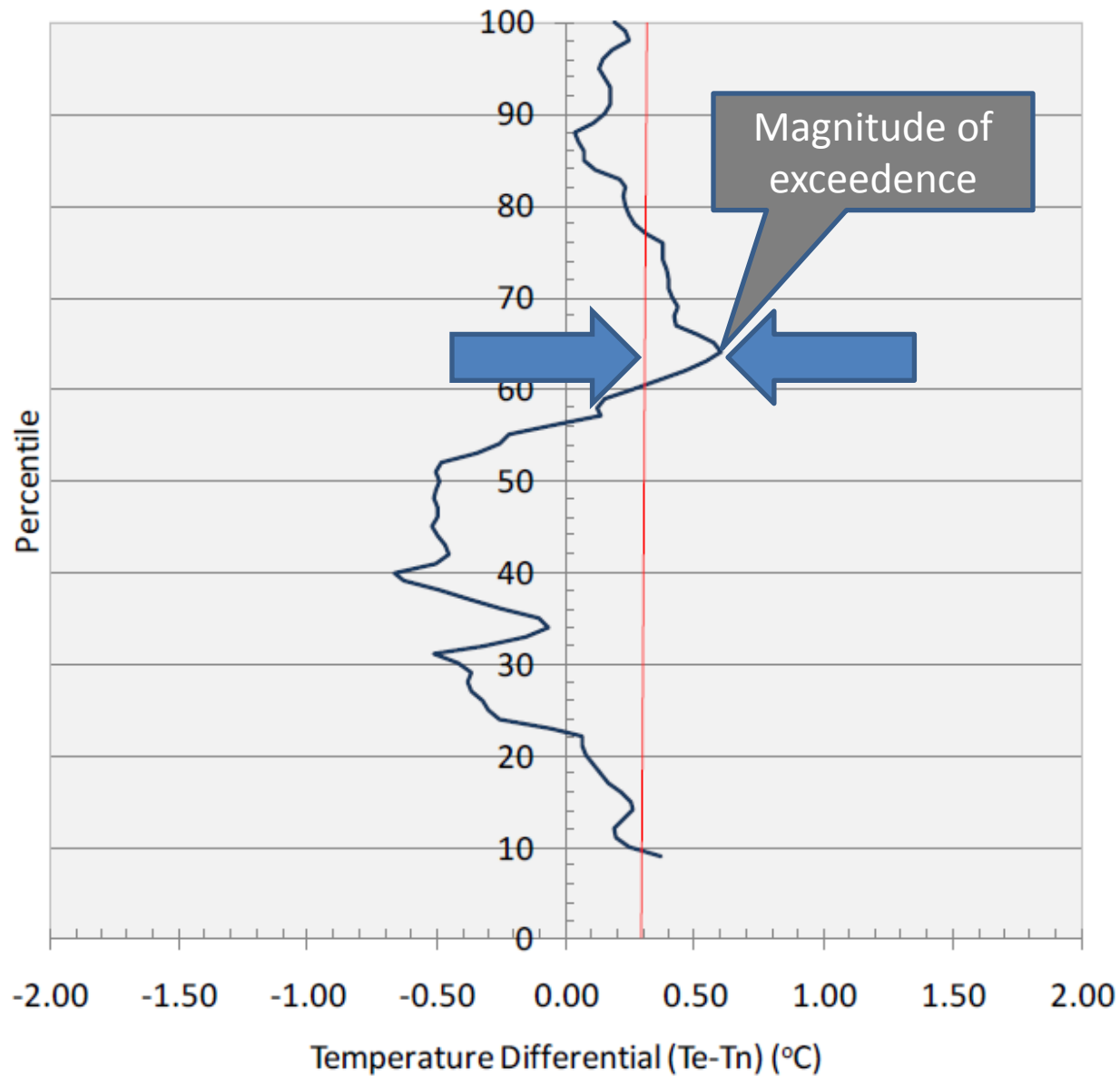


CFA in TMDL

- Once the two sets of data were plotted by cumulative frequency of occurrence, data points of the same rank in each data set were subtracted from each other.
- This difference was then plotted on the same vertical (frequency of occurrence) axis
- The vertical center line is zero difference
- The red line is the 0.3 C human use allowance in the state's natural conditions criteria

Lower Skookum Reach - 2004

1-Day Maximum

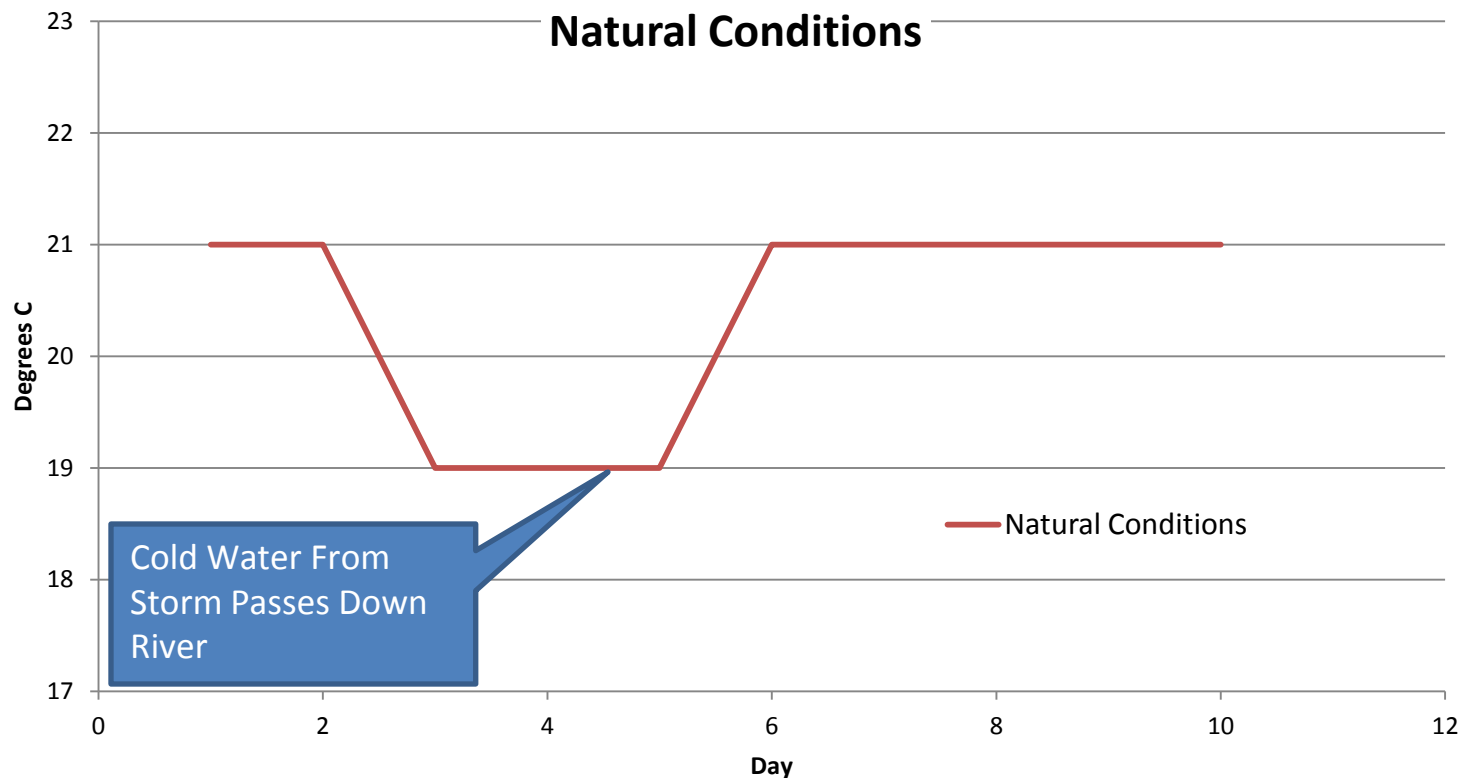


Time Lag

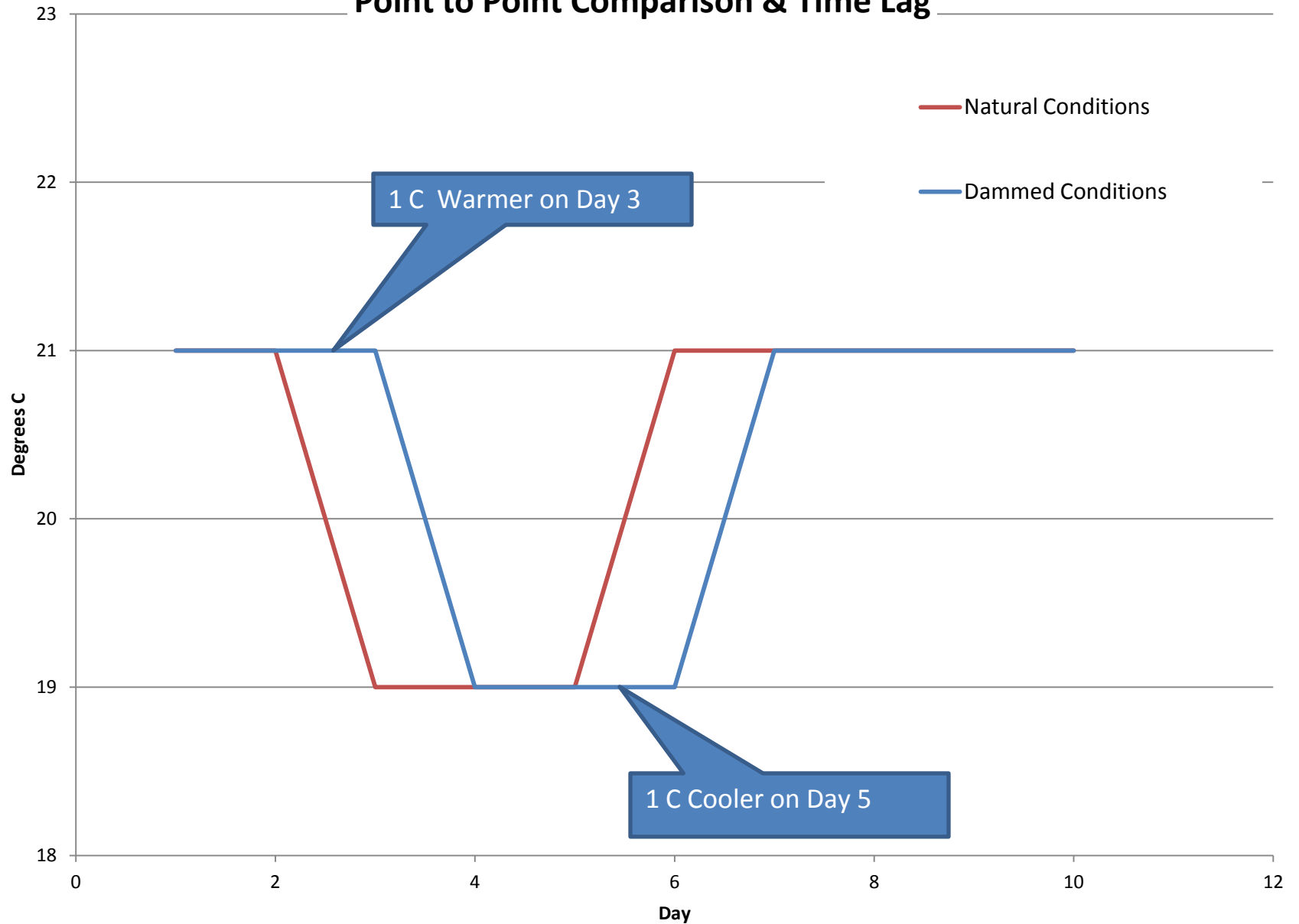
- Dams slow the travel time of water downstream
- In model simulations with dams in place (existing conditions) the same pulse of water will pass a location later than it will in the undammed (natural conditions) scenario.
- Comparing data points from the same time and place between the two model simulations can result in an brief exceedence of the criteria due to a cool pulse of water moving downstream

Time Lag

- If there is a storm upstream in the mountains a pulse of cool water will flow down the river



Point to Point Comparison & Time Lag



CFA in the TMDL

- Ecology changed the model data analysis method from daily comparison to CFA for these reasons:
 - CFA allowed for the comparison of different hydrologic conditions by minimizing differences in volume and flow as a result of hydroelectric facility operation
 - CFA minimized the effect of short-term events such as weather fronts
 - CFA provided a way to determine how often temperatures of a given magnitude occur within a specific amount of time
- Temperatures are estimated from a model. There are uncertainties in these estimates, and this is another reason model results are often aggregated over time and space to provide a more generalized assessment with greater confidence.

Why R10 believes CFA is Acceptable

- **States have discretion in their choice of technical analysis methods**
- **EPA's review of CFA use in the TMDL did not find any evidence that the method conflicts with the applicable water quality standards or biases the results.**
- **Previous TMDLs approved by EPA in the Northwest have used similar data aggregation and CFA methods (e.g., Willamette)**
- **There is nothing in the Tribe's WQS wording that would preclude the use of CFA to determine whether their WQS were being met at the Reservation boundary, in fact Ecology used more conservative assumptions in their analysis than the wording of the Tribe's WQS requires.**

CFA and Daily Maximum Criteria

- The Tribe is concerned that CFA is inappropriate to determine compliance with a daily maximum criteria because it “fails to preserve the relationship between thermal threshold and time of exposure”
- The 20 C daily maximum criterion is exceeded throughout the summer, even under natural conditions. The “thermal threshold” is exceeded throughout this time and the daily maximum criteria only applies for a few dates at the beginning and end of summer.
- Not clear what is meant by the “time of exposure” (calendar date?).
- It is reasonable to assess for persistent (more than one or two days) impact since TMDL allocations are established for time frames ranging from weeks to seasons.

CFA and Daily Maximum Criteria

- The Tribe contends that the TMDL's use of CFA to determine compliance with their daily maximum criterion is wrong, results in harm to the Tribe, and undermines tribal sovereignty.
- The TMDL applies the same methodology to state and tribal waters, so there is no bias against protection of tribal waters.
- If EPA sided with the tribe and rejected the state's interpretation of its standards, the state would claim harm and loss of sovereignty.
- EPA has not been able to satisfy both parties.

Points to Consider

- Model data is a tool for assessment, not a exact representation of river conditions; Data points in a model are estimations that have uncertainty
- Natural causes are excluded from these criteria by the wording of the standards and CFA was used to limit effects of natural conditions
- Ancillary considerations:
 - Beneficial use effects
 - Limited applicability of daily max criteria in the analysis

Washington's 20 C Daily Maximum Criterion

- Temperature shall not exceed a 1-day maximum (1-DMax) of 20°C due to human activities.
- When natural conditions exceed a 1-DMax of 20°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C;
- WAC 173-201A-200

Difference in Results - CFA vs Daily Comparison

- Review of model data from 8 of the 12 modeled reaches (Box Canyon Forebay – Stateline) in WA for 2004 & 2005 using Daily Comparison
 - 20 C is exceeded 1,147 times
 - In 39 of these instances the daily maximum criteria applied (3.4%)
 - Only 8 of these exceedences were greater than the load allocation for Box Canyon Dam
 - Average exceedence of the load allocation was 0.24 C
 - maximum exceedence was 1.15 C

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Natural Effects & Time Lag

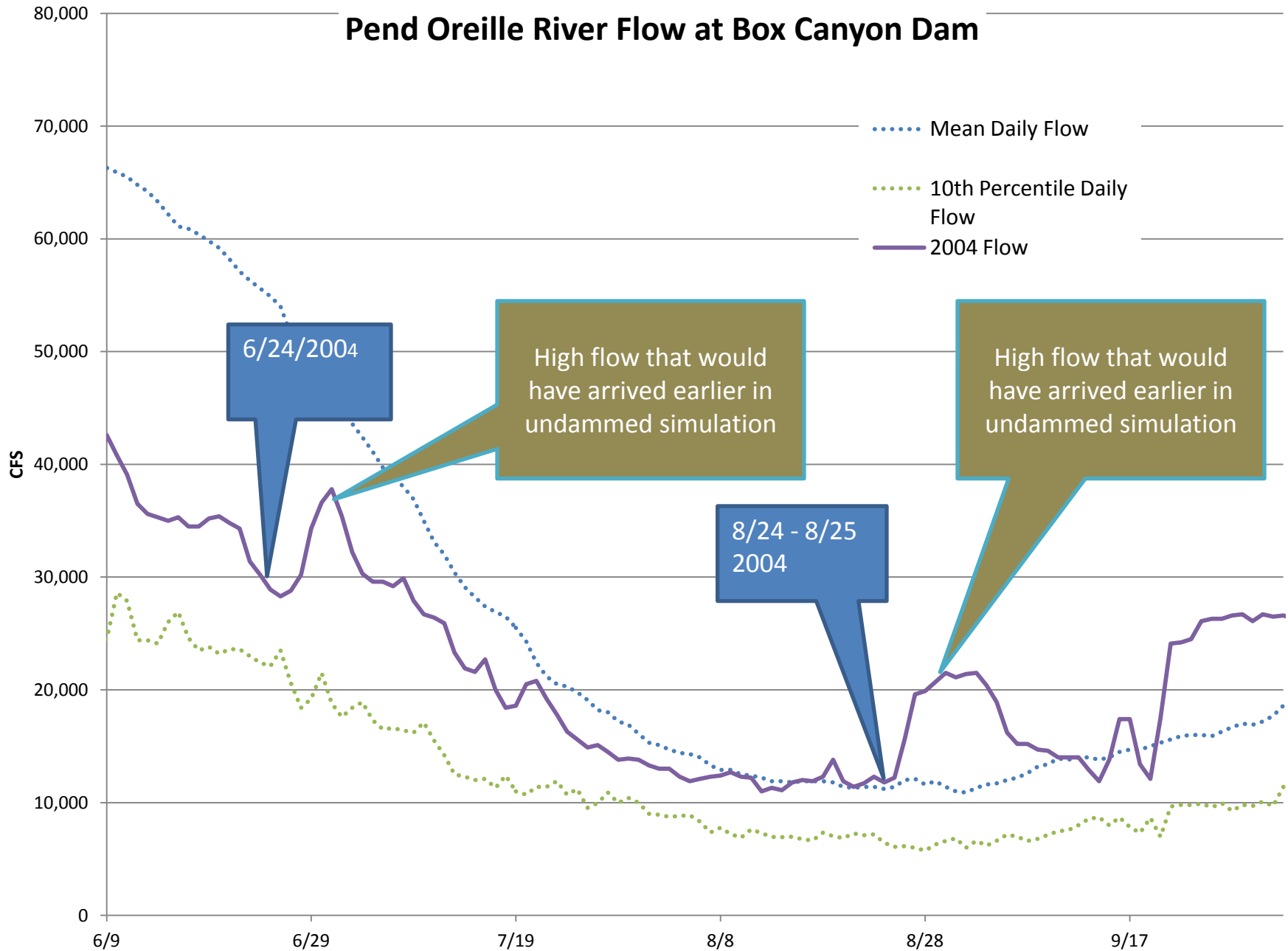
- Ecology used CFA analysis to exclude the time lag effects described above, which were not pertinent to the analysis because they were the result of natural weather events
- We evaluated whether the Daily Comparison exceedences resulted from time lag using:
 - Flow Data
 - Weather Data
 - Plots of the model data

Flow Data

- The Daily Comparison model analysis exceedences above the Load Allocation occur
 - June 24, 2004
 - June 30 – July 1, 2004
 - August 24 – 25, 2004

The first and last dates immediately precede a large increase in flow in the river that would have cooled stream temperatures and reached the same location earlier than in the undammed simulation

Pend Oreille River Flow at Box Canyon Dam



Weather Data

- Evidence from all climate stations used in model shows 90% cloud cover, high precipitation and unusually cool conditions between August 22 and 29, 2004, when half of the exceedences occurred
- Deer Park, Newport, Felts Field, and Tacoma Creek stations show storm conditions on June 30, 2004
- Local stations show some rain fall on June 24, 2004



Sandpoint, ID, USA

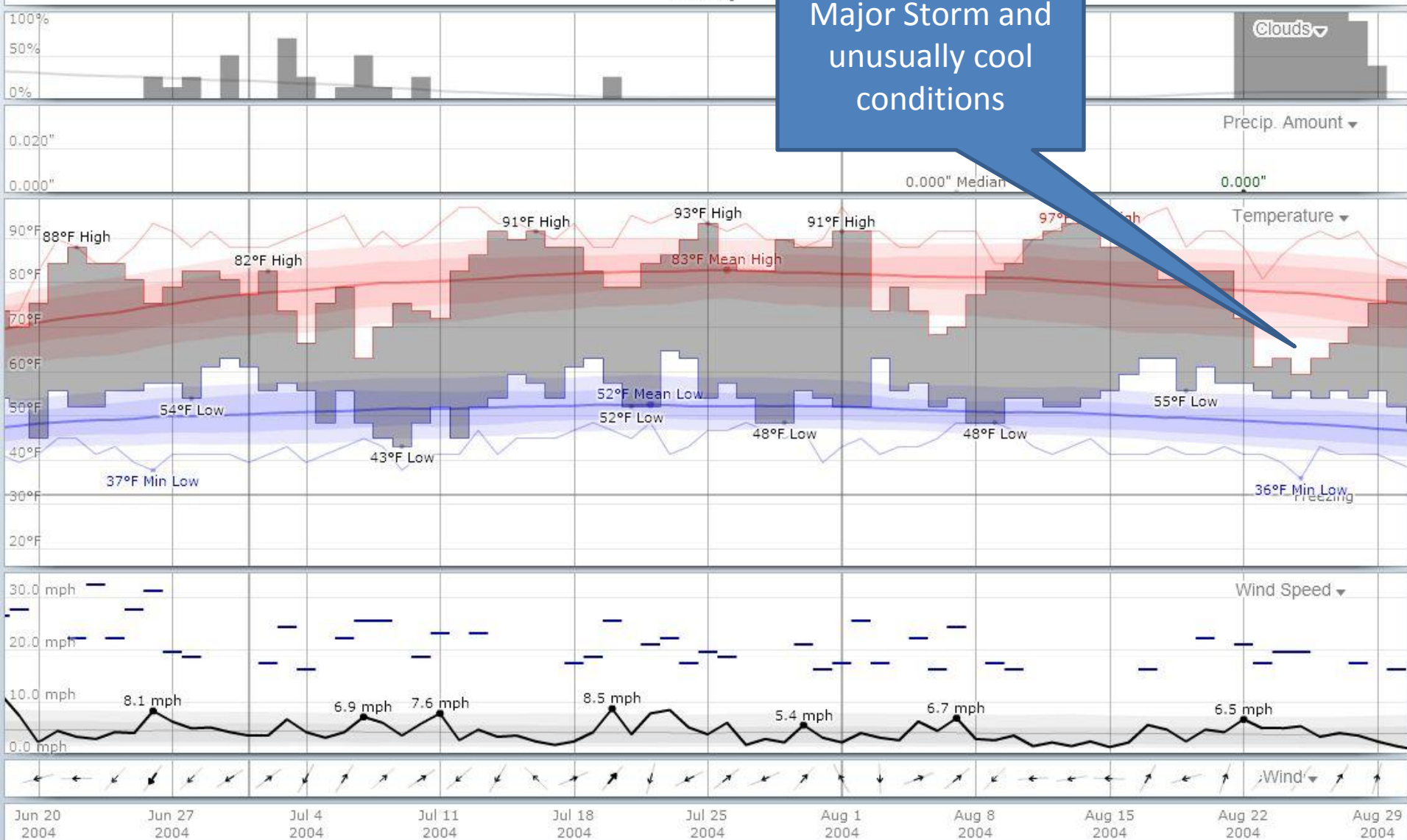
Forecast:

NOAA

Forecast Daily 1 quarter 1 year Averages

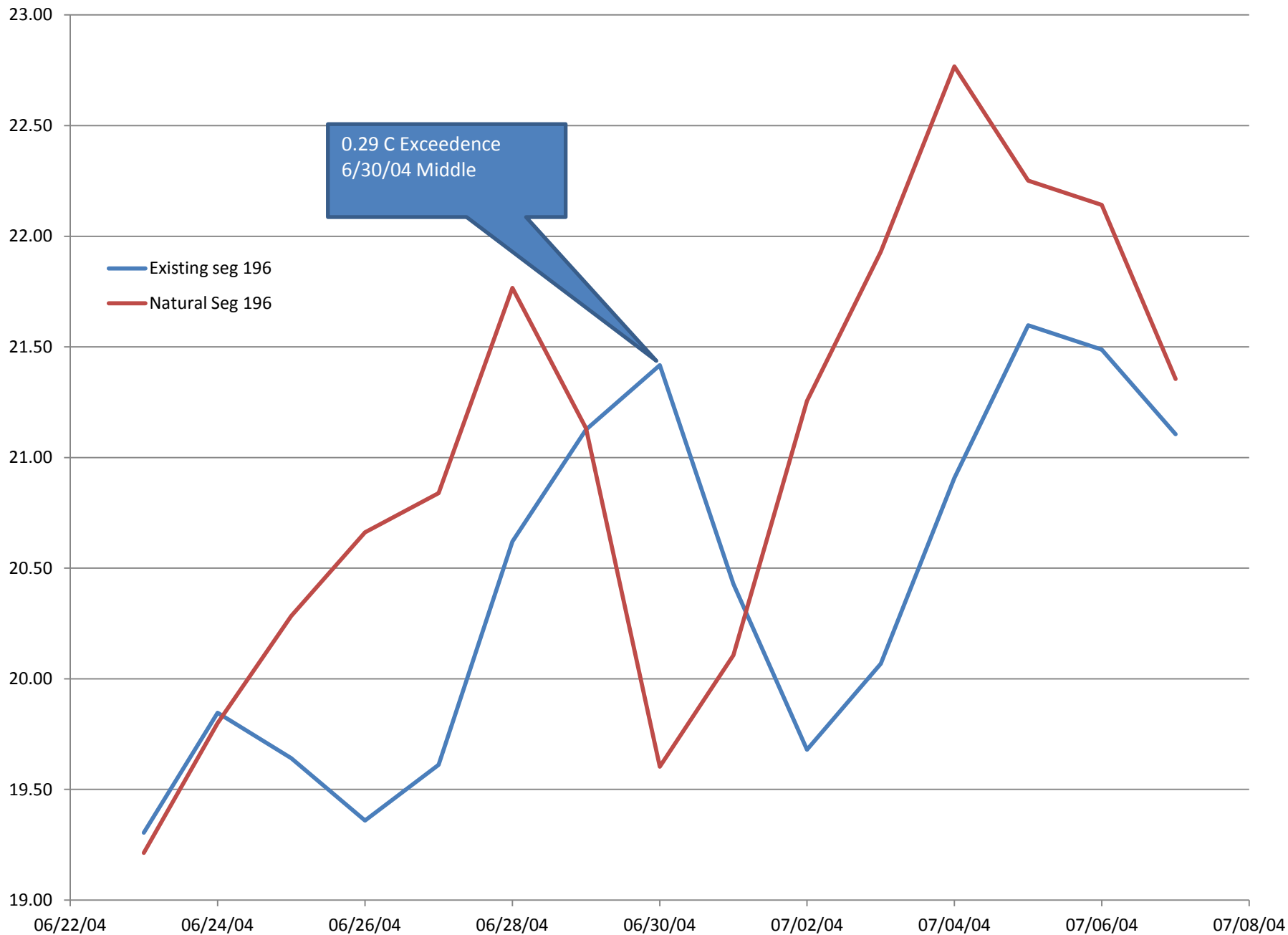
Graphs

History



Graphs of Data Show Time Lag

6 out of the 8 instances where the max daily criterion applies and that exceed the Box Canyon LA show a time lag effect when plotted



Kalispel Standards also have a Daily Maximum Criteria:

- 1) Temperature shall not exceed 18°C as a moving 7-day average of the daily maximum temperatures with no single daily maximum temperature greater than 20.5°C.
- When natural background conditions prevent the attainment of the numeric temperature criteria, human-caused conditions and activities considered cumulatively can increase temperature levels by only an additional 0.3°C.
- 12 b (1) Kalispel Tribal Water Quality Standards

Kalispel 20.5 C Daily Maximum Criteria

- The TMDL looked at segments 115 and 172, upstream and downstream of Kalispel Tribal waters to assess how to meet the Tribe's WQS and called for a 0.29 C reduction in this area
- Using Daily Comparison the 20.5 C maximum was exceeded 224 times in these segments over the two years
 - In 8 of these instances the daily maximum criteria applied
 - 5 exceeded the 0.29 C reduction the TMDL calls for at the Kalispel border.
 - The average exceedence over the called for reduction was 0.37 C; the maximum exceedence was 0.54 C

Natural Conditions

- The Kalispel Standards also contain a clause acknowledging that natural conditions may cause exceedences of the numeric criterion
- The exceedences at the Kalispel boundary occur on dates (8/24/04 – 8/29/04 & 6/30/04) that have been discussed above as having evidence of flow and weather conditions associated with time lag
- Plots of the data also show time lag effects

Kalispel Daily Maximum Criteria

- 1) Temperature shall not exceed 18°C as a moving 7-day average of the daily maximum temperatures with no single daily maximum temperature greater than 20.5°C.
- When natural background conditions prevent the attainment of the numeric temperature criteria, human-caused conditions and activities considered cumulatively can increase temperature levels by only an additional 0.3°C.
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Summary of Evidence that Exceedences Are Caused by Natural Effects

Date	Segment	Degrees C Over Load Allocation/ Reduction	Plots Show Time Lag	Flow Data	Local Weather Data
6/24/04	357	0.20		X	Fair
6/24/04	332	0.17		X	Fair
6/30/04	196	0.29	X		Strong
7/1/04	347	1.11	X		Strong
8/24/04	358	1.15	X	X	Strong
8/24/04	316 – 319	0.92	X	X	Strong
8/25/04	358	0.48	X	X	Strong
8/25/04	347	0.08	X	X	Strong
6/30/04	172	0.45	X		Strong
8/24/04	172	0.01	X	X	Strong
8/27/04	115	0.54		X	Strong
8/28/04	115	0.43		X	Strong
8/29/04	115	0.45		X	Strong

Human Use Allowance not allowed where Daily Maximum Criteria Applies

- The Tribe is concerned because the TMDL treats all exceedences as though the natural conditions criteria apply. The 0.3 C human use allowance is used for all exceedences, but is not allowable where the daily maximum criteria apply.
- **The daily maximum criteria apply in 3.5% of the instances where the numeric criteria are exceeded, using the Daily Comparison method**
- **In an even smaller sub set of these instances the allocations and reductions set in the TMDL do not bring about attainment of the standard – 8 days (0.7%) for the state's criteria and 5 days (2.3%) at the reservation boundary**
- **Those instances show strong evidence of time lag effects due to natural conditions, which would exempt them from the daily maximum criteria**

Stateline Temperature Loading

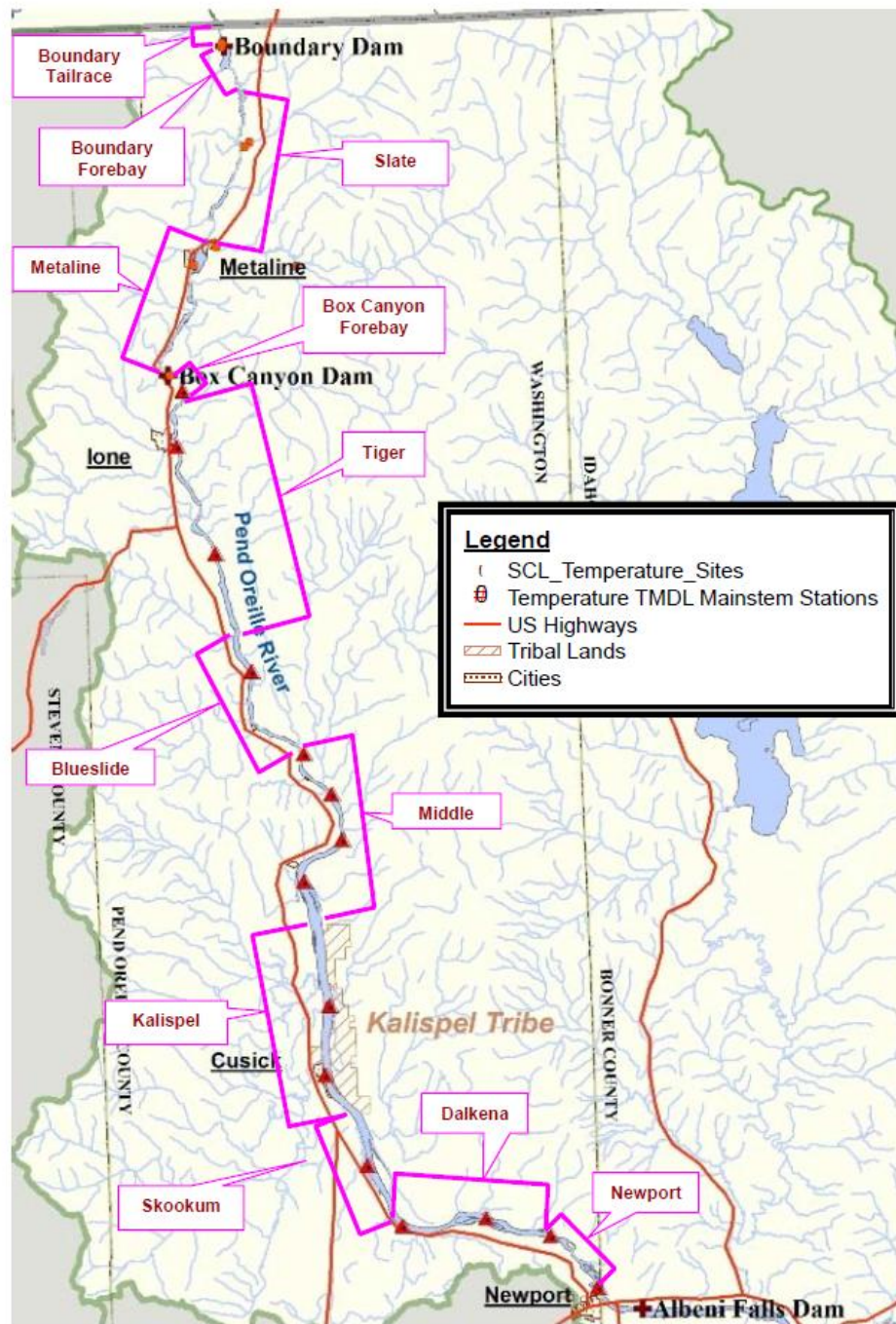
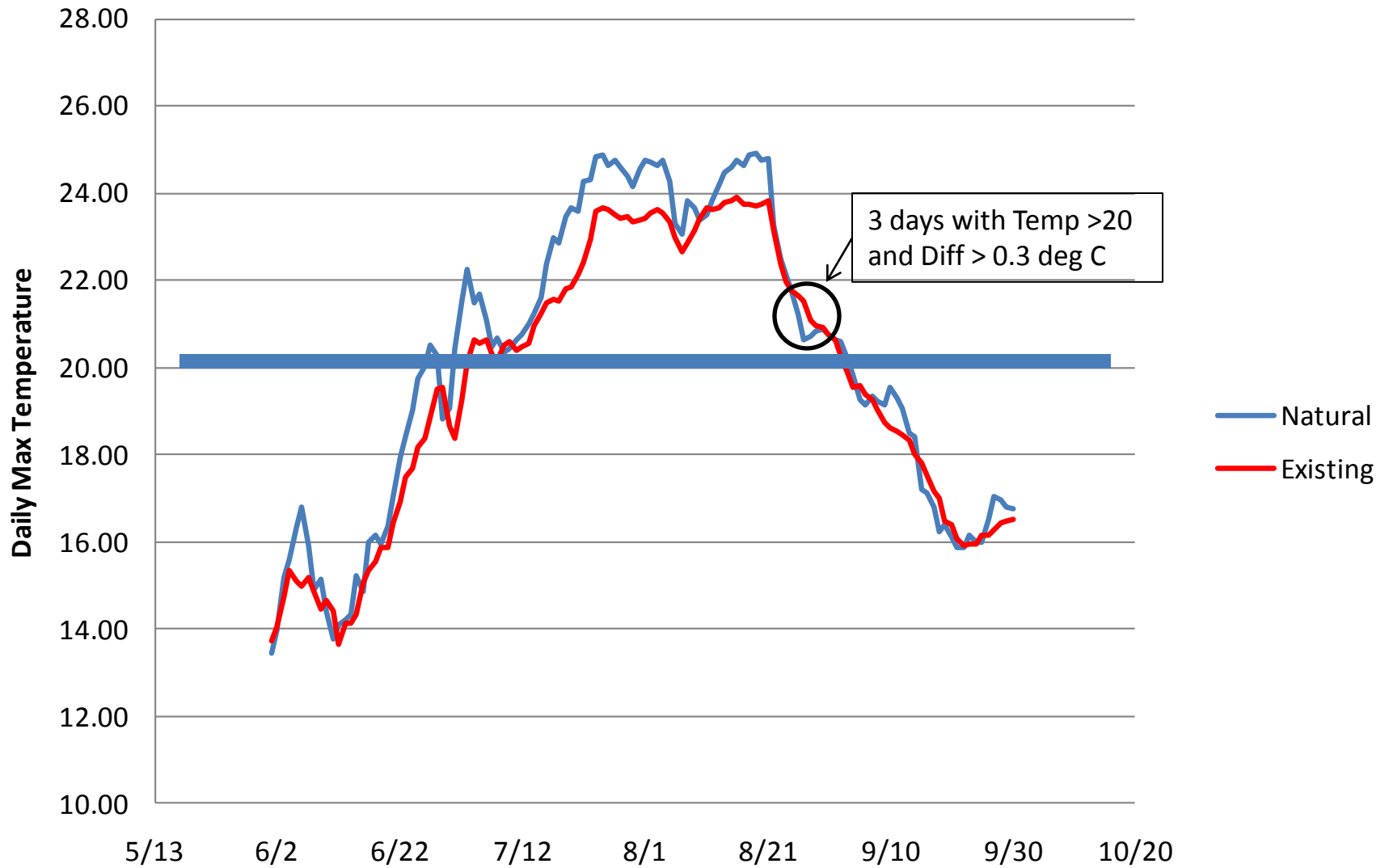


Figure 7. Pend Oreille River reaches and monitoring locations.

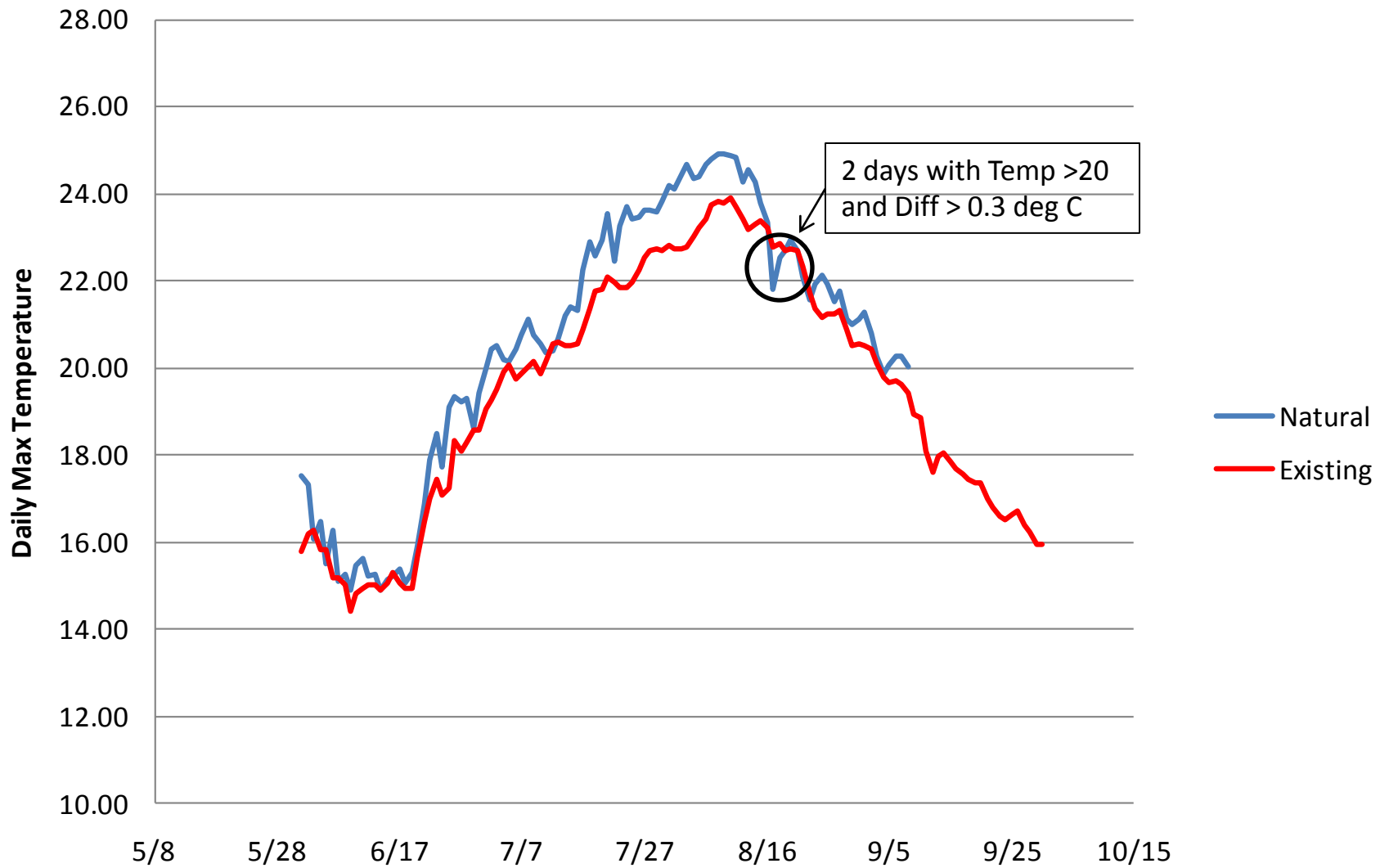
2004

At State Line



2005

At State Line



Albeni Falls Dam

- Kalispel Tribe makes two assertions
 - (1) State line is impaired based on the “correct” analytical method
 - (2) On days when tribal standards are exceeded (downstream of border in tribal waters), Albeni is contributing heat to the river.
 - Therefore, Albeni should be assigned a TMDL allocation

Issue 1: Region 10 Analysis of State Line

- Notes
 - River at border is WA state waters
 - One source in ID – Albeni Falls dam – removed in natural conditions model simulation
 - This changes geometry, depth, travel time, flow and temperature
 - Multiple slicing/dicing of the model output
 - Seasonal CFA and multiple point-by-point (daily) methods
 - Focused on daily max state standard (20 deg C)
 - July/August is period with temps > 20 deg C
 - Model output is max from water column
 - typically surface temperatures
 - we have not looked at potential volume averaging effects

Time series model output

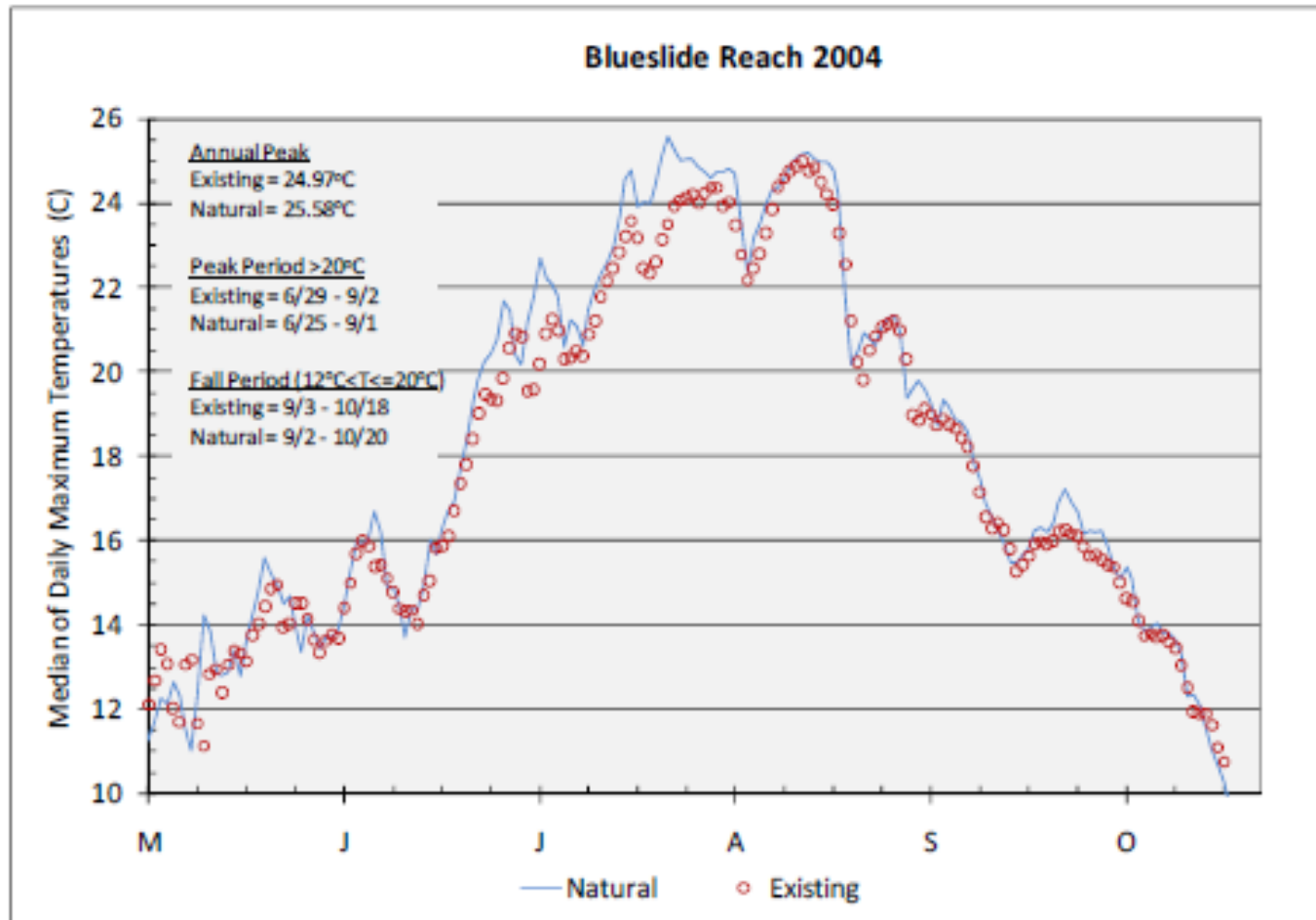


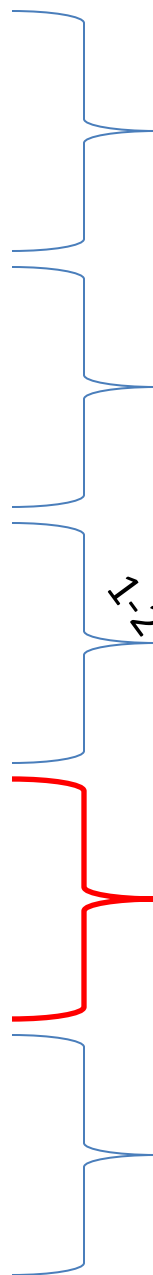
Figure 8. Modeled natural and existing median daily maximum temperatures for the Blueslide reach in 2004.

Date Natural Existing Diff

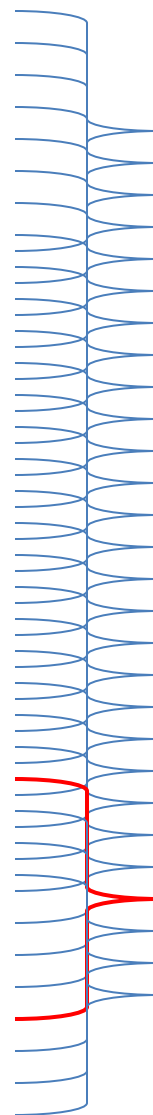
06/30/05	19.41	18.58	-0.83
07/01/05	19.98	19.07	-0.91
07/02/05	20.43	19.27	-1.17
07/03/05	20.51	19.52	-0.99
07/04/05	20.19	19.90	-0.29
07/05/05	20.16	20.05	-0.10
07/06/05	20.43	19.75	-0.69
07/07/05	20.76	19.87	-0.89
07/08/05	21.11	20.03	-1.09
07/09/05	20.74	20.13	-0.60
07/10/05	PAIRED ANALYSIS	20.68	0.68
07/11/05		20.20	0.20
07/12/05	20.39	20.55	0.16
07/13/05	20.69	20.58	-0.11
07/14/05	21.19	20.52	-0.67
07/15/05	21.39	20.53	-0.86
07/16/05	21.31	20.57	-0.74
07/17/05	22.25	20.88	-1.38
07/18/05	22.90	21.37	-1.52
07/19/05	22.59	21.78	-0.81
07/20/05	22.96	21.80	-1.16
07/21/05	23.52	22.08	-1.45
07/22/05	22.44	21.95	-0.49
07/23/05	23.28	21.83	-1.45
07/24/05	23.71	21.85	-1.86
07/25/05	23.43	21.97	-1.47
07/26/05	23.46	22.26	-1.20
07/27/05	23.64	22.52	-1.12
07/28/05	23.62	22.69	-0.93
07/29/05	23.60	22.72	-0.88



30-60 avg



1-2 Week avg



7 day rolling avg



Point Data
90%, Max

Rank Natural Existing Diff

Lowest
temp

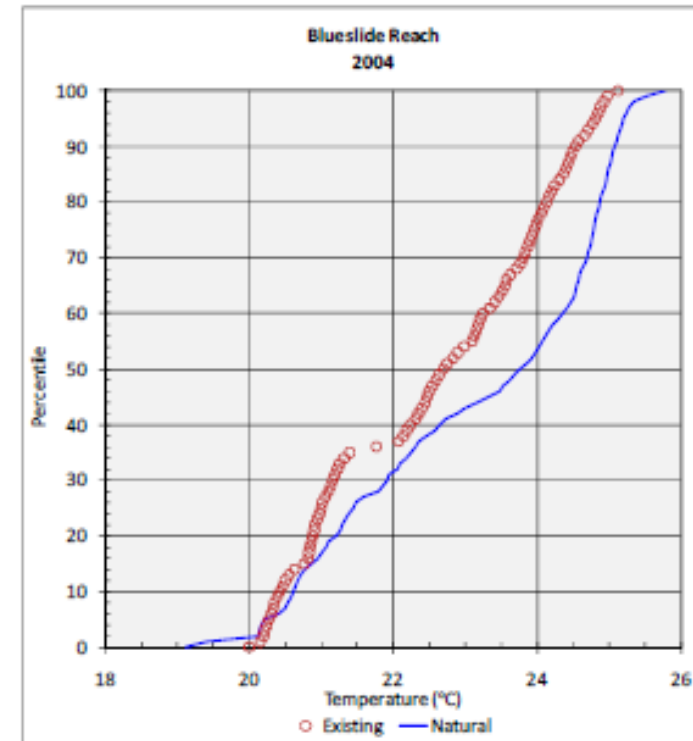
1	19.41	18.58	-0.83
2	19.98	19.07	-0.91
3	20.16	20.05	-0.10
4	20.19	19.90	-0.29
5	20.37	20.17	-0.20
6	20.39	20.55	0.16
7	20.43	19.75	-0.69
8	20.43	19.27	-1.17
9	20.51	19.52	-0.99
10	20.55	19.87	-0.68
11	20.60	20.50	-0.11
12	20.76	19.87	-0.89
13	20.76	19.87	-0.89
14	21.11	20.03	-1.09
15	21.19	20.52	-0.67
16	21.31	20.57	-0.74
17	21.39	20.53	-0.86
18	22.25	20.88	-1.38
19	22.44	21.95	-0.49
20	22.59	21.78	-0.81
21	22.90	21.37	-1.52
22	22.96	21.80	-1.16
23	23.28	21.83	-1.45
24	23.43	21.97	-1.47
25	23.46	22.26	-1.20
26	23.52	22.08	-1.45
27	23.60	22.72	-0.88
28	23.62	22.69	-0.93
29	23.64	22.52	-1.12
30	23.71	21.85	-1.86
31	23.83	22.71	-1.12
32	24.09	22.74	-1.35
33	24.20	22.82	-1.39

CFA ANALYSIS



TMDL uses maximum
difference for all ranked pairs

Highest
temp



CFA plots

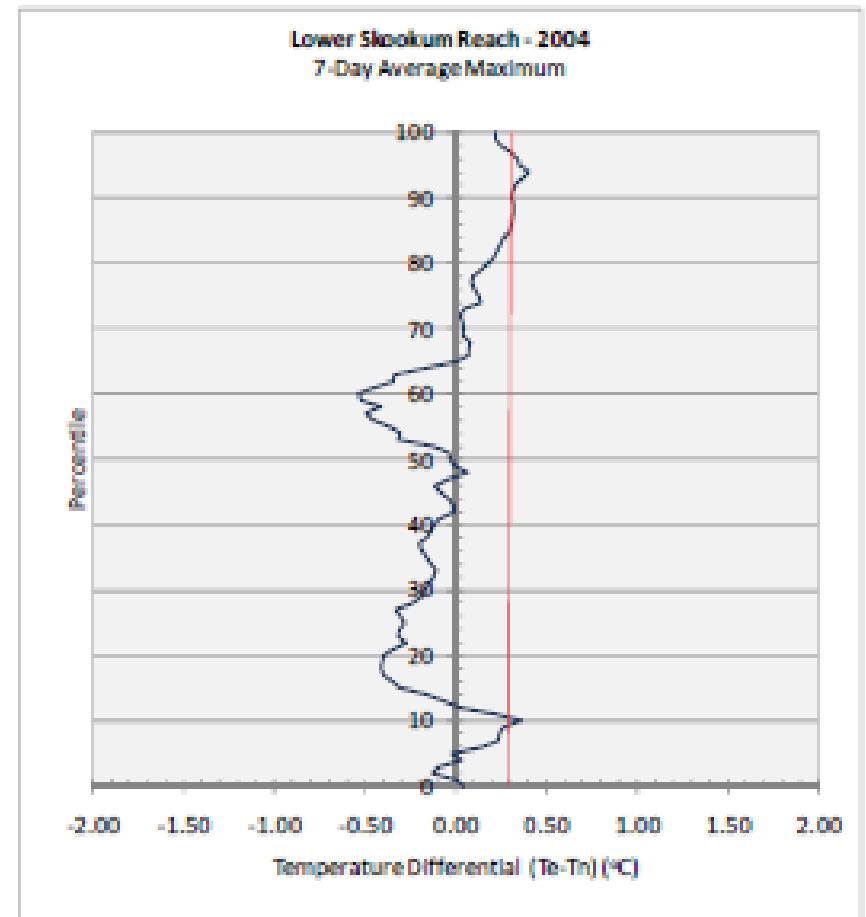
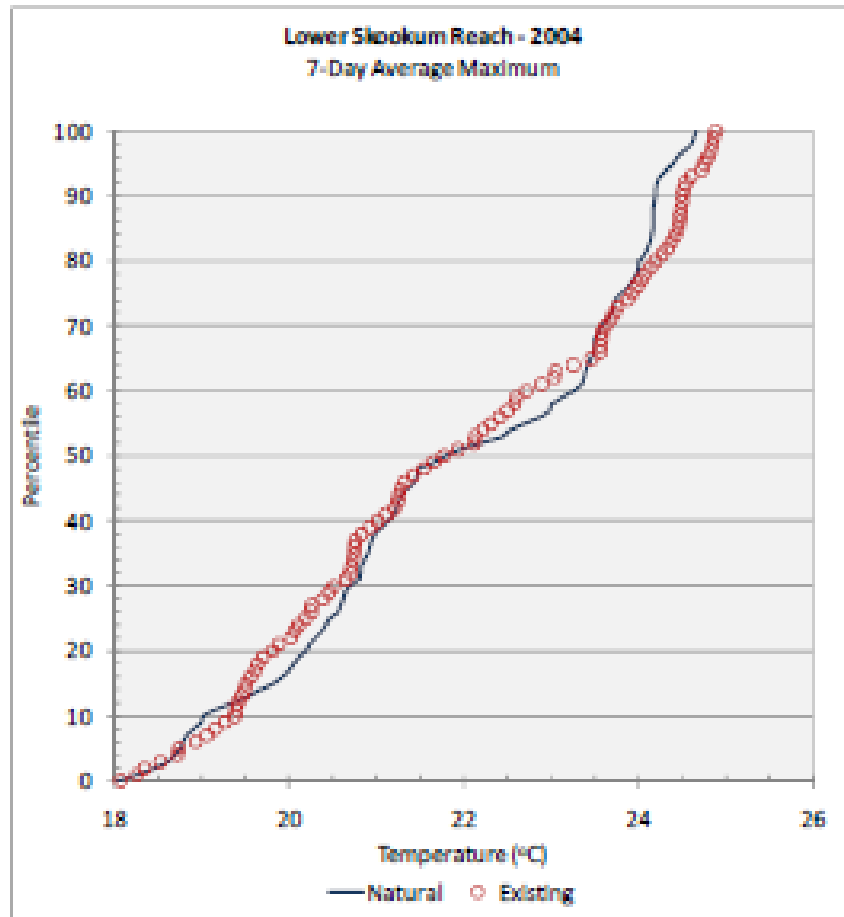
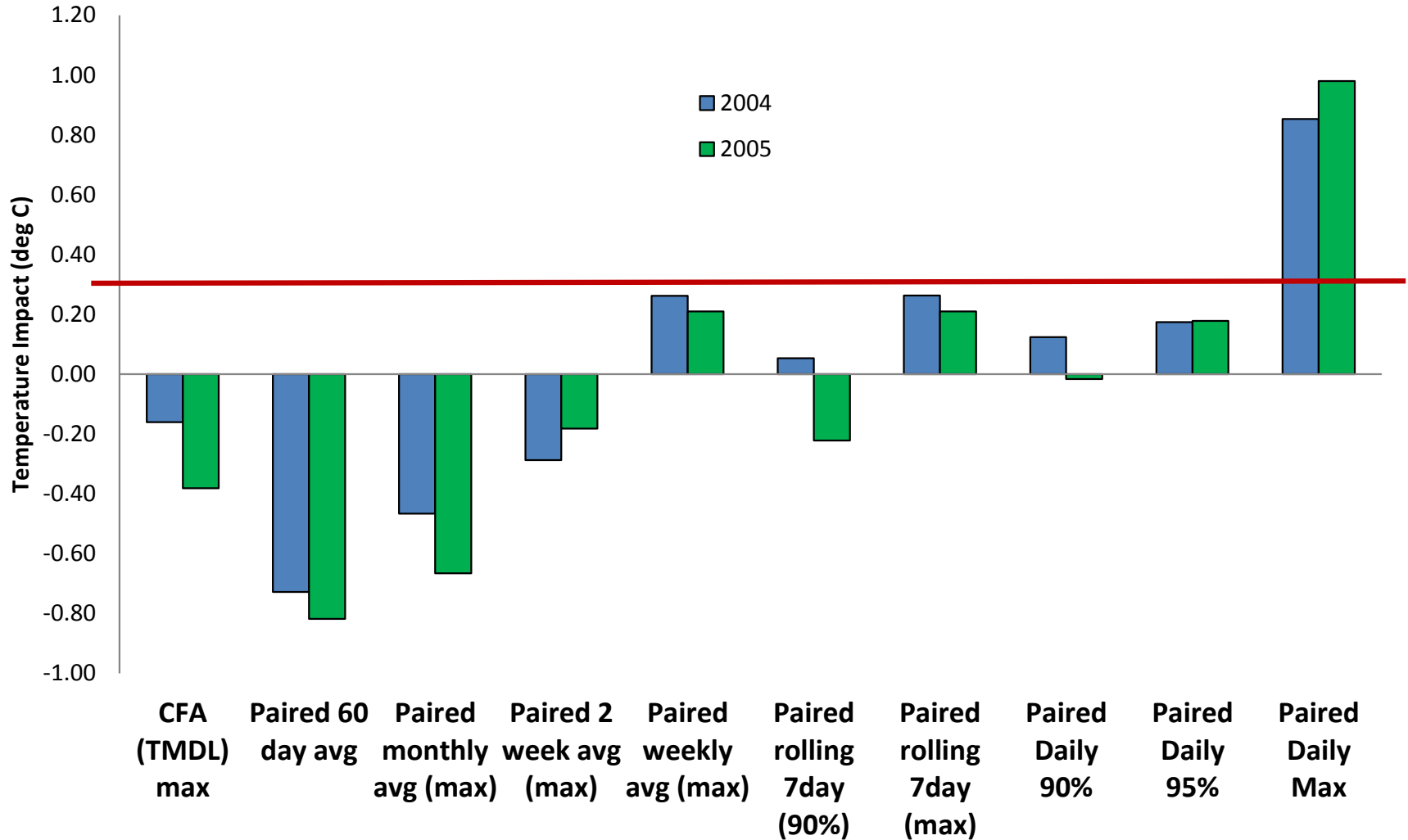


Figure 20. Segment 115 cumulative frequency distribution of the 7-day average of the daily maximum temperatures along with the associated temperature differential. Analysis includes the natural and existing conditions observed at lower Skookum reach (segment 115) in 2004.

2004 and 2005 Model Output Analyses State Line, July/August



State of Washington Impairment Call

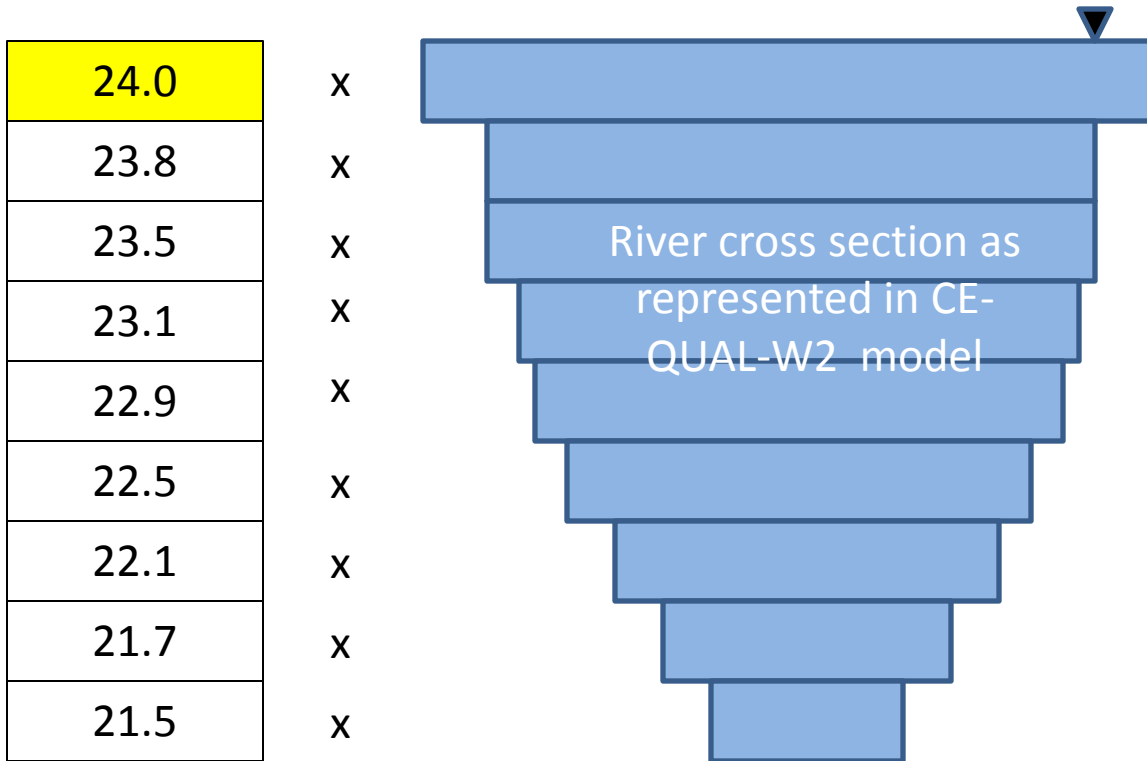
- State discretion
- For direct measurements, 90th percentile is common for 303d listing
- In PdO case, all methods, including paired 90th percentile, show impacts less than the 0.3 deg C limit
- One exception: Paired maximum value
- Weak basis to overrule state decision

Issue 2: Albeni heat contribution warrants an allocation

- On almost all days, Albeni sends colder-than-natural water across the border
- Box Canyon dam forebay temps are generally warmer-than-natural
- TMDL allocation is difference at Box forebay caused by presence of both dams.
 - TMDL allocated temp difference from both dams to Box Canyon
- Box Canyon did not object
- TMDL allocations are mathematically sound
 - Issue is only who is responsible for impacts in Box Canyon impoundment
 - State assigns allocation to Box Canyon PUD.

Volume Averaging

Sum of (cell temp x cell volume)/(total volume) = volume-weighted average temperature



- Surface cell has greater volume than bottom, represents more habitat
- Volume-averaging used to get a single value that best represents water column as a whole
- Changes magnitude of estimated impairment

Attainment of Tribe's WQS Using CFA

Reservation Borders Data

- The Tribe found 37 days of exceedences at the reservation borders in 2004, averaging 0.35 C and with maximum of 0.87 C above the Tribe's criteria
- Our review of data using Daily Comparison could not replicate the tribe's but found exceedences at the reservation boundary above the called for TMDL reductions on 25 days of the 2 year period modeled
- The exceedences ranged from 0.54 C to 0.01 C above the TMDL reductions and averaged 0.24 C, which is similar to the Tribe's results
- The Tribe did not mention that the TMDL does acknowledge impairment to Tribal waters and calls for reductions to meet the Tribe's WQS

Daily Comparison Analysis Exceedences at Borders of Kalispel Reservation Above the TMDL Reduction

Date	Natural Conditions Temperature	Existing Conditions Temperature	Exceedence of Called for Reduction	Boundary of Reservation	Applicable Criterion
8/14/04	24.16	24.75	0.05	Downstream	18 C 7- DADM
8/15/04	24.31	24.85	0.01	Downstream	18 C 7- DADM
8/31/04	20.41	20.98	0.03	Downstream	18 C 7- DADM
9/7/04	19.00	19.56	0.02	Downstream	18 C 7- DADM
9/8/04	18.84	19.50	0.11	Downstream	18 C 7- DADM
9/9/04	18.80	19.40	0.07	Downstream	18 C 7- DADM
8/21/05	22.32	23.09	0.23	Downstream	18 C 7- DADM
8/22/05	22.16	22.97	0.27	Downstream	18 C 7- DADM
8/23/05	22.08	22.79	0.17	Downstream	18 C 7- DADM
8/25/05	21.86	22.42	0.02	Downstream	18 C 7- DADM
6/30/04	19.20	20.97	0.45	Upstream	20.5 C Daily Maximum
8/24/04	20.43	20.80	0.01	Upstream	20.5 C Daily Maximum
8/27/04	20.49	21.33	0.54	Downstream	20.5 C Daily Maximum
8/28/04	20.14	21.22	0.43	Downstream	20.5 C Daily Maximum
8/29/04	20.20	21.24	0.45	Downstream	20.5 C Daily Maximum
7/30/04	23.62	24.50	0.29	Downstream	Natural Conditions
8/11/04	23.57	24.56	0.40	Downstream	Natural Conditions
8/12/04	23.71	24.81	0.51	Downstream	Natural Conditions
8/13/04	24.09	24.80	0.12	Downstream	Natural Conditions
8/30/04	20.51	21.23	0.13	Downstream	Natural Conditions
7/28/05	23.48	24.10	0.04	Downstream	Natural Conditions
8/18/05	22.09	23.12	0.44	Downstream	Natural Conditions
8/19/05	22.27	23.08	0.22	Downstream	Natural Conditions
8/20/05	22.46	23.38	0.33	Downstream	Natural Conditions
8/24/05	21.02	21.90	0.29	Downstream	Natural Conditions

Daily Comparison Exceedences of Tribe's WQS vs TMDL Determination

	Above the Kalispel Reservation (RM 72, Segment 115)		Below the Kalispel Reservation (RM 63.6, Segment 172)	
Criteria	Average differential	Maximum differential	Average differential	Maximum differential
Kalispel daily maximum	0.06	0.60	-0.50	0.22
Kalispel 7DADM	-0.03	0.40	-0.51	0.14

CFA results in a lower magnitude of temperature violation (0.6 degrees versus 0.9 degrees).

- The maximum differential value is less than or equal to the sum of the human use allowance (0.3 C) and the reductions specified in the TMDL for the boundaries of the reservation.
- The CFA method is slightly less stringent than the Daily Comparison method.
- Daily Comparison would set the seasonal allocation at the maximum impact in the paired data of 0.9 C – one that was estimated by the model to occur on a single hour of a single day and may have been the result of time lag or model uncertainty.
- TMDL based reductions on the maximum difference rather than the mean difference
- Ecology refused to use vertical averaging, which would have reduced the TMDL reductions substantially.
- Notice that the average differential is negative or very small, meaning that the river is generally colder with the dams in place than without at the Tribal borders – this particularly true at the upstream border nearer the Idaho line – shown as “Below the Kalispel Reservation”

Tribal Waters affects from Upstream Sources - Stateline

- Tribe states: Violations occur on 87% of the days during the period from 8/9/04 to 9/1/04; on 85% of these days, heat flow across Stateline is greater under existing conditions than it was under natural conditions”
- **Our analysis of the data does not confirm these assertions**
 - Using Daily Comparison, exceedences above the reductions in the TMDL occur on 11 days out of the 24 day period mentioned – 46%. All but two of these were at the downstream border of the reservation nearer to Box Canyon Dam, which received a substantial allocation and was called on to reduce temperatures at the reservation boundary as well
 - During this time there are 4 days of exceedences (using Daily Comparison) at the state line – 17%. These are the only exceedences at the stateline in 2004 and they occur during the major storm that was discussed above as a cause of time lag effects

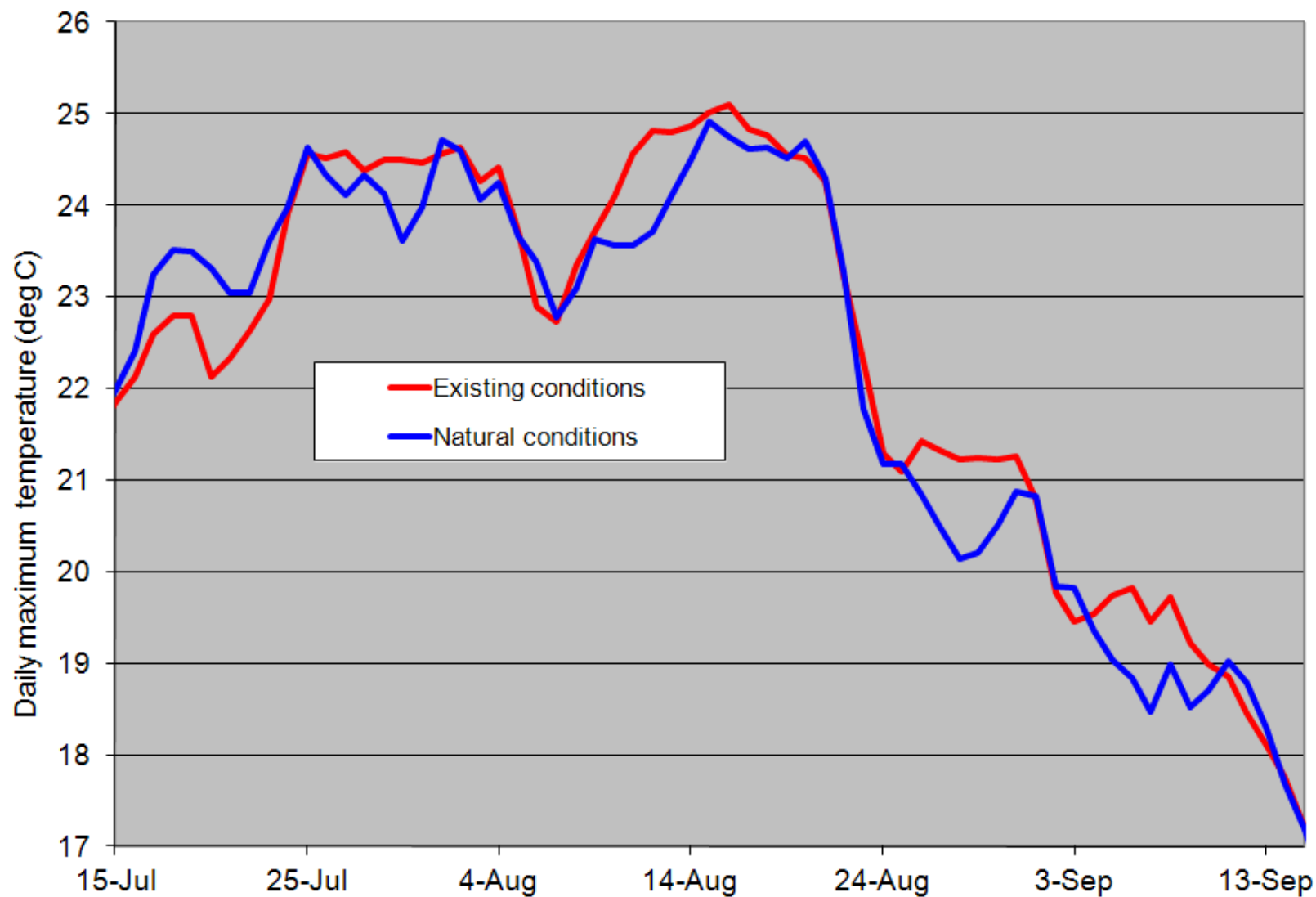
Ecology's Use of CFA

- The Tribe pointed out that the Willamette TMDL provides no explanation for the use of CFA and that Ecology did not look elsewhere in the Region for supporting reasons for use of CFA
- Oregon DEQ did not need to build a detailed explanation of their use of CFA, because there were no comments on the method during the public process. The use of CFA was not controversial until the Tribe brought it up during this TMDL. Ecology described the method and reason for using CFA in the TMDL.
- Last statement is misleading since there were no other examples of this kind of CFA analysis in the Region.

Use of CFA

- The Tribe used the graph that follows to illustrate that there is no significant time lag at Tribal boundary
- Ecology has indicated that the time lag issues are more clear/problematic at the downstream end of the study area.
- Despite this, our analysis, described above, has shown convincing evidence of time lag effects in these lower reaches as well.
- If the time lag issue is deemed to be a reasonable concern, then it's also reasonable (and probably necessary) for the state to apply the same method across the entire study area, including tribal waters.

Comparison of temperatures under existing and natural conditions at the upstream end of the Kalispel Tribe's reservation (River Mile 72)



Basis for Use of CFA

- Reducing time lag effects was not the only reason for using CFA
- Other reasons Ecology gave for use of CFA:
- Allows for the comparison of different hydrologic conditions by minimizing differences in volume and flow as a result of hydroelectric facility operation or land use changes
- Provides a way to determine how often temperatures of a given magnitude occur within a specific amount of time

It also helps account for model uncertainty

CFA Pooling Period Issue

“Even if time lag were an issue, the pooling period does not correspond to the lag”

- “The selected remedy for the lag (93-day CFA) is grossly disproportionate to a time lag that is on the order of days according to Ecology, and at most 1 day on tribal waters”
- **Note the pooling period in the TMDL is actually 62 days, the pooling period in the Willamette TMDL was 93 days**
- **Ecology has not claimed that the pooling period corresponds to the time lag. It encompasses the period when temperatures exceed numeric criteria.**

CFA in the TMDL

- Our review of the TMDL indicates that Ecology had a sound scientific rationale for adopting CFA
- The TMDL allocations are much more stringent than they might have been had Ecology used a more common analysis method such as volume weighted averaging or used a one dimensional model with Daily Comparison
- The Dam operators were dissatisfied enough with the allocations that they both requested dispute resolution and filed in court to sue Ecology over the TMDL

Why Use CFA and Reject Volume Weighted Averaging?

- The Tribe felt that Ecology's decision to use CFA was incongruous with its decision not to allow volume-weighted averaging because they believe both methods would obscure the impacts of warmer surface waters by averaging with cooler deeper waters and "it is not rational to interpret the standards to prohibit spatial manipulations that mask water quality violations, but to permit temporal manipulations that achieve the same effect."
- **Ecology had several choices to make on methodology. They adopted CFA (time-aggregation) but not spatial aggregation. CFA was chosen by Ecology precisely because it would reduce model uncertainty and time lag effects without masking the dam's impact, which volume weighted averaging would have done.**
- **This is the typical situation when a regulator disappoints stakeholders on all sides by striking a balance. It is rational to examine and select model-data processing methods that account for model uncertainty, water quality standards metrics, allocation challenges, and a myriad of policy considerations.**
- **Instead of characterizing the choices made by Ecology as "incongruous", we believe the state took a tough stance on this particular element of the analysis (volume averaging)**
- **The TMDL also used the maximum difference from the CFA rather than simply averaging the natural-existing differences over weeks/months.**
- **The decision to use only CFA, rather than combining it with volume weighted averaging as the Willamette TMDL did and the dam operators requested, refutes the tribe's assertions that Ecology was pro-industry on this project.**

TMDL Use of CFA Is Technically Sound

- The Tribe claims that the fundamental principle for using CFA is that individual occurrences are random
- CFA is discussed in the texts quoted by the Tribe primarily in regard to performing statistical tests
- TMDL's approach is not based on statistical testing and does not attempt to make statistically based conclusions regarding the similarity (or lack of agreement) between the data sets
- CFA is used in the TMDL solely for comparing excursions of the temperature criteria.
- The use of CFA in the TMDL does not require random data and is appropriate.

Use of CFA in TMDLs - An Incomplete List

- Willamette River Temperature TMDL, OR, 2006
- Florida Mercury TMDL, 2012
- Commonly used in bacteria TMDLs in many states including, CT, HI, ND, DE, NC, NJ, OR, AZ, TN, TX
- Stockton Deep Water Shipping Canal Dissolved Oxygen TMDL, CA, 2005
- Muddy Creek and the Yadkin River Turbidity TMDL, NC, 2011
- Upper Clinch Watershed pH TMDL, TN, 2009
- Potomac Estuary PCB TMDL, DC, 2007
- Lake Elsinore and Canyon Lake Nutrient TMDL, CA, 2005
- Buckhannon River pH and metals TMDL, WV, 2010
- Indian Creek, Southampton Creek Paxton Creek and Goose Creek and Sawmill Run Watersheds total phosphorus and sediment TMDLs, PA (Issued by EPA) 2008
- Ridenour Lake Metals TMDL, WV,

Response to Tribe's CFA Objections

- Daily Maximum Criteria – Minimal applicability; exceedences show time lag effects
- State Line Heat Loading – Exceedences only found using Daily Comparison; that method showed cooler than natural conditions for all but 4 days
- Tribal WQS and Sovereignty – standards do not call out a specific method
- Reasons Ecology chose CFA – no bias and solid scientific basis; state has discretion
- Data Pooling Period – No technical issue with pooling period, comparable to other TMDLs?
- Use of CFA with Non-Random Data - Random data not required for TMDL analysis

Conclusion

- Region 10 believes approval is appropriate
- If that is not the agreed-upon direction, need to develop next steps with Tribe and consider outreach to Ecology and possibly other stakeholders
- Anticipate litigation either way
- Awaiting HQ feedback and guidance on these issues